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Omitted

【 0 0 1 4 】

【EMBODIMENTS OF THE INVENTION】

There will be described in detail the present invention by embodiments as below.

(THE EMBODIMENT 1)

FIG.1 is a diagram for explaining an optical amplifier and an optical amplification apparatus of the present invention. An optical amplifier 10 includes a rare-earth element doped fiber 11 having a function of amplifying an optical signal, a pump light source 12 which oscillates optical output that causes an inverted population in an electronic level of a rare-earth element in the rare-earth element doped fiber 11, and a wavelength division optical multiplexer/demultiplexer 13 multiplexing the optical output of this pump light source 12 to the rare-earth element doped fiber 11.

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The optical amplifier 10 of the present invention is characterized of including an optical circulator 14 having 3-ports on an optical output side of the rare-earth element doped fiber 11 to prevent optical oscillation. That is, the output side of the rare-earth element doped fiber 11 is connected to a first port 14A of the optical circulator 14. A second port 14B of the optical circulator 14 is connected to an optical fiber cable 18 via optical connectors 15 and 16. A third port 14C of the optical circulator 14 is connected to a light receiver 19.

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FIG.2 is a diagram for explaining the optical circulator 14 used in the present embodiment. An optical signal input to the first port 14A of the optical circulator 14 is output from a polarized beam splitter 20F being the second port 14B, via a polarized beam splitter 20A, a faraday rotator 20B, a crystal optical rotator 20C, and a prism 20D. Moreover, an optical signal input to the second port 14B being the polarized beam splitter 20F is output from an output end of the polarized beam splitter 20A being the third port



14C, via the crystal optical rotator 20C, the faraday rotator 20B, and the prism 20D. This optical circulator 14 having 3-ports has a function as an optical isolator between the first port and the second port and between the second port and the third port.

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There will be described based on FIG.3 a difference of a light receiving level of the light receiver 19 between the case where a conventional optical multiplexer/demultiplexer 52 of 1:99 is used and the case where the optical circulator 14 is used, in the case where the optical connectors 15 and 16 are detached from each other so that an optical output of +10dBm is emitted into space from the optical connector 15, in the above optical amplifier 10. FIG.3 shows output current characteristics of the light receiver 19 composed of a typical photodiode, and it is understood from this figure that when the optical circulator 14 is used, it is possible to take out from the light receiver 19, an output current which is about one hundred times as high as that when the conventional optical multiplexer/demultiplexer 52 of 1:99 is used.

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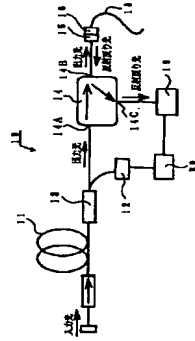
As described above, an optical multiplexer/demultiplexer and an optical isolator can be omitted by using the optical circulator 14. As a result, a configuration of the optical amplifier can be simplified, and an economical cost burden of optical parts can be reduced. Moreover, the problems such as a branching loss which has occurred by using the optical multiplexer/demultiplexer, an excess loss involved in the optical multiplexer/demultiplexer, a connecting loss which has occurred when connecting the optical multiplexer demultiplexer to other optical parts and the optical fiber, and the like can be solved. Further, 30 is a control circuit of the pump light source 12 in FIG.1. This control circuit 30 detects a return light of the optical fiber cable 18 connected to the second port 14B of the optical circulator 14 at the light receiver 19, and then, when a value thereof exceeds a predetermined value, stops the oscillation of the pump light source 12.



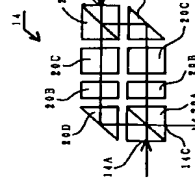




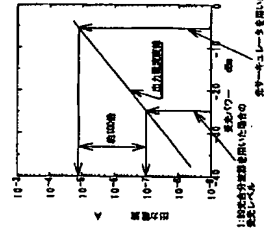
【図1】



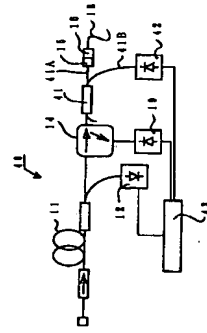
【図2】



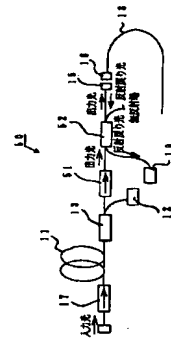
【図3】



【図4】



【図5】



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